



TENNESSEE DEPARTMENT OF AGRICULTURE Regulatory Services Division

E85 Fuels – Issues and Solutions





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**E85 Fuels – Issues and Solutions
Presentation Outline**

- ✓ Review Fundamental Requirements for E85
- ✓ Blending E85 from Gasoline and Denatured Fuel Ethanol
- ✓ Meeting Seasonal Volatility Control Range
- ✓ Dispenser Labeling Requirements



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E85 Fuels Requirements

- ✓ All Fuel Standards in TN are based on ASTM International Standards and Tennessee Rules
 - ASTM D5798 is the governing document for Fuel Ethanol (Ed75-Ed85) for Automotive Spark-Ignition Engines (e.g. E85).
 - Covers important parameters such as volatility, EtOH content, Acidity, Inorganic Chlorides, Water,...
 - References all Standard Test Methods that are to be used to verify the characteristics of the fuel.
- ✓ Legislative Authority T.C.A. 47-18-1301 et seq.





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E85 Fuels Requirements

ASTM D5798

The property that most often results in fuel failures is vapor pressure
E85 fuel must fall within a minimum and maximum range for vapor pressure.

- ✓ October 2008 Coordinating Research Council issued CRC Report No. 652:
“2008 CRC Cold-Start and Warmup E85 And E15/E20 Driveability Program”
- ✓ In this 87 page report, the conclusions were that:
 - For E85 fuels, driveability improved with:
 - increasing vapor pressure
 - 4.7 psi E85 fuel had most demerits
- ✓ Class 1 & 2 fuels with vapor pressure tested in cool conditions, 23F, 33F, and 47F.
- ✓ E85 vapor pressures of 4.7, 5.7, and 7.0 psi used in fleet tests.



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E85 Fuels Requirements ASTM D5798

- ✓ July 2009 Coordinating Research Council issued CRC Report No. 654: “2008 CRC Cold-Start and Warmup E85 Cold Ambient Temperature Driveability Program”.
- ✓ In this 84 page report, the conclusions were that:
 - For E85 fuels, cold start and warm-up driveability improved with
 - increasing ambient temperatures
 - increasing vapor pressure
 - increasing hydrocarbon content
 - No-starts only occurred at < 20 deg. F ambient temperatures
 - Total weighted demerits most pronounced at 0F and below
- ✓ Class 3 fuels were tested.
- ✓ Results inconclusive in terms of justification of lowering vapor pressure minimum.



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E85 Fuels Requirements

ASTM D5798

Question: What is the Issue with E85 Compliance?

Answer: Meeting the Minimum Vapor Pressure Requirement

Solution: Blending to Minimum Ethanol Limits

E85 Samples Tested Past 12 Months

Number of Samples Tested	% Violation for Vapor Pressure
53	20.75 (11 samples)



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E85 Fuels Requirements
ASTM D5798

Vapor Pressure Range Requirements for Tennessee, PSI

December – February	9.5-12.0
March	7.0-12.0
April	7.0-9.5
May	5.5-9.5
June - August	5.5-8.5
September	5.5-9.5
October	7.0-9.5
November	7.0-12.0



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E85 Fuels Requirements ASTM D5798

What is the Minimum Ethanol Content For Compliance TODAY

November – March	70%
April - May	74%
June - August	79%
September - October	74%



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**E85 Fuels Requirements
ASTM D5798**

What is being done to alleviate the problem?

ASTM International Committee D02, Subcommittee A has balloted a change in the specification that will allow the minimum ethanol content to be lowered to 68% for all volatility classes.

If this ballot passes, will it guarantee compliance if blended to this target level?

No!

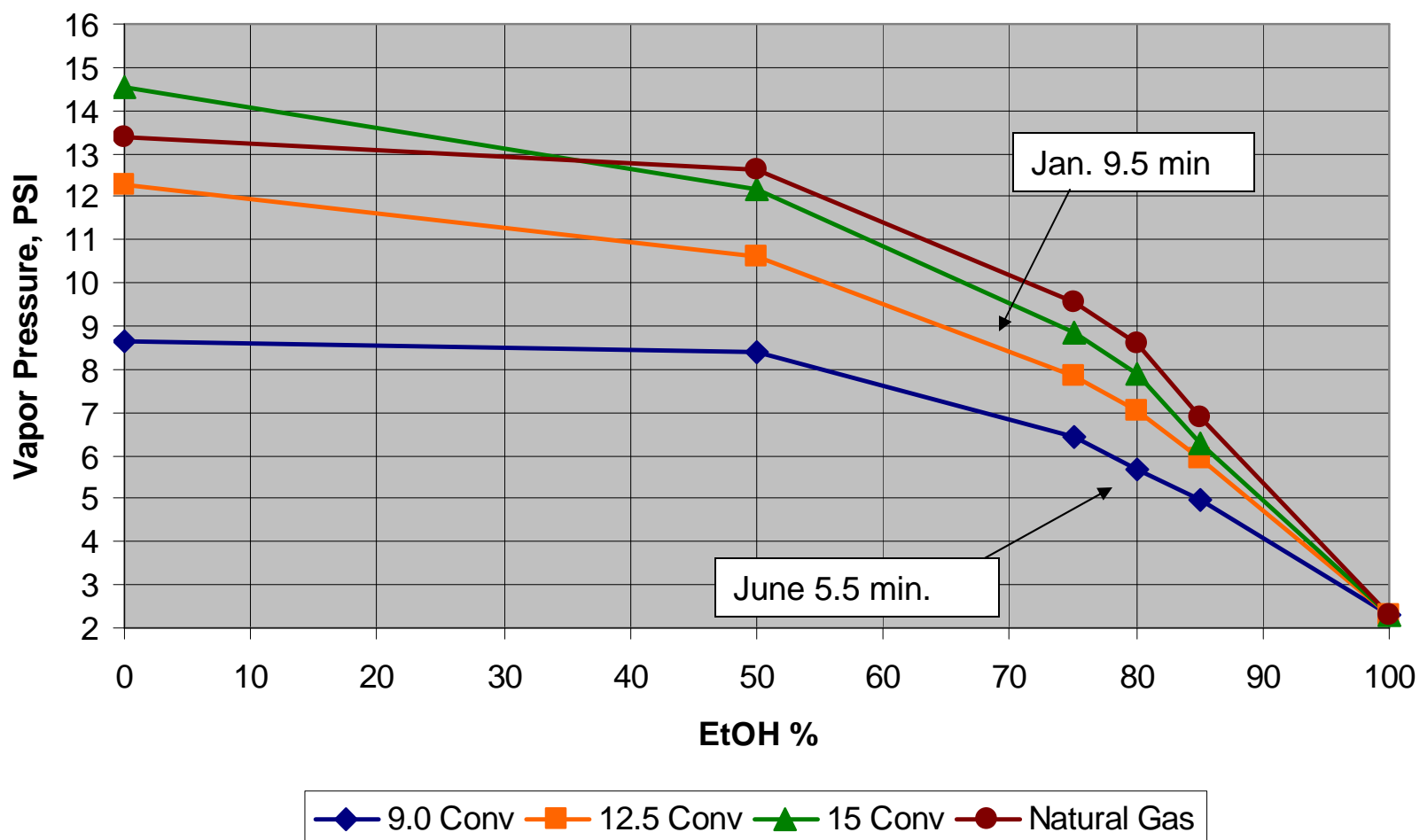
MONTHS (TN)	Current Min.	Proposed Min.
November – March	70%	68%
April - May	74%	68%
June - August	79%	68%
September - October	74%	68%



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Vapor Pressure of Higher EtOH Blends





Other Considerations For Blending E85 Fuel Ethanol

- ✓ ASTM D4806 Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spar-Ignition Engine Fuel has been developed primarily as a spec for blendstock material for E10 blends.
- ✓ There are a few properties of Denatured Fuel Ethanol (E100) that, if at the max limits, would compromise the suitability for blending to E85 Fuel Ethanol:
 - Inorganic Chlorides – low concentrations corrosive to metals
 - Copper – catalyst for oxidation which leads to gum formation
 - Acidity – corrosive in low concentrations (e.g. acetic acid)



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Other Considerations For Blending E85 Fuel Ethanol

Specification Limits

Product Property	E85	E100
Inorganic Cl, ppm, max	1	10
Cu, mg/L, max	≈0.08	0.1
Acidity, mg/L, max	0.005	0.007

Effect of Blending with DFE @ Max Limits:

Property % Ethanol	Acidity .005 max	Cu .07 max	Inorganic Cl 1 max
E85	.00059	.085	8.5
E79	.0055	.079	7.9
E74	.0051	.074	7.4
E70	.0049	.070	7.0

Solution: We have NOT seen real world field problems in these areas. However, you may choose to use purchase specs that will ensure that DFE is suitable for blending E85 Fuel Ethanol.



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E85 Classification and Method of Sale Requirements

- ✓ Declare E-85 on PTD's
- ✓ "How to Identify Fuel Ethanol," fuel ethanol shall be identified by the capital letter E followed by the numerical value volume percentage. (Example: E85)
- ✓ "Retail Dispenser Labeling," each retail dispenser of fuel ethanol shall be labeled with the capital letter E followed by the numerical value volume percent denatured ethanol and ending with the word "ethanol." (Example: E85 Ethanol)
- ✓ "Additional Labeling Requirements," fuel ethanol shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.





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Questions?

